REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 15-18 are pending, with Claims 1-14 cancelled and Claims 15-18 added by the present amendment.

In the Official Action, Claims 1-6 and 8 were rejected under 35 U.S.C. §112, first paragraph; Claims 1-4 and 7-10 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kerfoot et al. (U.S. Patent 6,704,511, hereinafter Kerfoot) in view of Ryu et al. (U.S. Patent No. 6,330,384, hereinafter Ryu) and Kosaka (U.S. Patent 5,986,800); Claims 5 -11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kerfoot, Ryu, Kosaka in view of Alphonsus et al. (U.S. Patent 5,764,405, hereinafter Alphonsus); Claims 6 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kerfoot, Ryu and Kosaka in view of Matis (U.S. Patent 4,726,644); and Claims 13 and 14 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kerfoot, Ryu and Kosaka in view of Chalmers et al. (U.S. Patent 6,184,985, hereinafter Chalmers).

New Claims 15-18 are added to present Applicants' invention in varying language. Support for these claims is found in Applicants' originally filed specification.[1] No new matter is added.

Briefly recapitulating, Claim 15 is directed

> A wavelength division multiplexing and optical transmission apparatus, comprising:
>
> an optical multiplexer configured to transmit a multiplexed optical signal including a non-modulated spectrum slice optical signal and a plurality of modulated optical signals;
>
> a plurality of optical transmitting units configured to output the plurality of modulated optical signals to respective input ports of the optical multiplexer, each of the optical transmitting units

[1] Specification, Fig. 7, page 27, line 24 – page 28, line 24.

configured to modulate a unique wavelength with a plurality of data signals and to output a respective modulated optical signal occupying a respective portion of a signal band; and

a dummy optical signal source device configured to generate the non-modulated spectrum slice optical signal, including:

an input optical amplifier device having an input terminated at no reflection to cut off any input signal and having an output configured to output an amplified spontaneous emission light signal,

a light dividing element connected the output of the optical amplifier device and configured to output plural signals related to the amplified spontaneous emission light signal,

a first and second plurality of bandpass filters having adjacent filter pass bands, each bandpass filter having a respective bandpass characteristic and each arranged to receive a respective one of the plural signals output from the light dividing element and configured to output a respective first and second non-modulated spectrum slice optical signal components, the first non-modulated spectrum slice optical signal component being adjacent on a high side to the signal band, the second non-modulated spectrum slice optical signal component being adjacent on a low side to the signal band,

a first and second dummy signal optical multiplexer, each dummy signal optical multiplexer having inputs connected to outputs of the first and second plurality of bandpass filters, respectively,

a first and second output optical amplifier, each having an input connected to an output of a respective one of the first and second dummy signal optical multiplexer, and having respective outputs, and

a dummy signal optical multiplexer connecting the outputs of the first and second output optical amplifier to the optical multiplexer.

Claim 16 is directed to

The wavelength division multiplexing and optical transmission apparatus of Claim 15, wherein the dummy optical signal source device further includes

> a third, fourth and fifth plurality of bandpass filters having adjacent filter pass bands, and arrange to receive respective ones of the plural signals output from the light dividing element,
>
> a third, fourth and fifth dummy signal optical multiplexer connected to a respective one of the third, fourth and fifth plurality of bandpass filters,
>
> a third, fourth and fifth output optical amplifier connected to a respective one of the third, fourth and fifth dummy signal optical multiplexer, the third and fifth output optical amplifier configured to amplify at a heightened amplification level when the fourth output optical amplifier does not output a corresponding non-modulated spectrum slice optical signal so as to maintain a predetermined overall gain profile of the non-modulated spectrum slice optical signals input to the dummy signal optical multiplexer.

Claims 17 and 18 are directed to corresponding methods for wavelength division multiplexing and optical transmission.

Kerfoot describes a wavelength division multiplex optical signal including a WDM combiner to provide a source signal, at least one transmitter coupled to an input of the WDM combiner, a broadband noise source, and a filter coupled between the broadband noise source and another input of the WDM combiner. In one embodiment, the filter is an optical notch filter. In another embodiment, the filter includes a WDM demultiplexer coupled through plural filters to provide a plurality of noise signals, and a WDM multiplexer coupled through at least one of the plural filters to respective noise signals.

In Kerfoot, head end 130 provides a source signal that combines information signals and filtered noise signals. Information signals come from one or more transmitters 150. At the same time, ***filtered noise signals come from noise source 138*** through filter circuitry 140. The filter blocks optical signals at wavelengths that correspond to the wavelengths of the information signals from the transmitters 150 so noise is not added to the desired information signals. The filter passes optical signals (e.g., noise signals from broadband noise source 138) at wavelengths not within the stop band. By loading unused channels (called idler

channels) with noise channels, the information signals on the used channels do not draw all of the power from optically pumped fiber amplifiers in repeaters 110. Instead, the noise signals carried to the idler channels draw their proportionate share of the repeaters power as if they were information signals. In this way, all WDM channels will appear to be fully loaded from their initial operation. As more capacity is needed from network 100, additional transmitters 150 are added and filter circuitry 150 is modified or replaced so as to block optical signals at the wavelengths of the information signals provided by transmitters 150.[2]

However, as acknowledged in the Official Action, Kerfoot does not disclose or suggest a signal input terminal terminated without reflection, let alone Applicants' claimed input optical amplifier device having an input terminated at no reflection to cut off any input signal and having an output configured to output an amplified spontaneous emission light signal. That is, the broadband noise source 138 of Kerfoot is not an optical amplifier having a signal input terminal terminated without reflection. To cure this deficiency, the Official Action applies Ryu.

Ryu describes an optical system having a light source, couplers and amplifiers. Fig. 3 of Ryu shows a signal input terminal terminated without reflection. However, Ryu and Kerfoot, individually or in combination, fail to disclose or suggest Applicants' claimed dummy optical signal source device.

Fig. 4 of Kosaka discloses an optical transmission system having an optical power adjusting unit 8 that includes low pass optical filters 20 connected to optical gain adjusters 17. However, Kosaka does not cure the deficiencies of Ryu and Kerfoot.

Applicants have considered the remaining references and submit these references also do not cure the deficiencies of Kerfoot. Because none of the applied references, individually or in combination, disclose or suggest all the elements of independent Claims 15 and 17,

[2] Kerfoot, column 4, lines 16-42.

Applicants submit the inventions defined by Claims 15 and 17, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.[3]

Regarding dependent Claims 16 and 18, with Applicants' claimed invention, the amplified spontaneous emission light signal output from the optical amplifier 32 is divided into a plurality of amplified spontaneous emission light signals.[4] Then, a plurality of dummy signals from the light dividing element 33 are multiplexed in the optical multiplexer 38 with the plurality of amplified spontaneous emission light signals. Thus, when one of the filtered dummy signals is degraded, redundancy (n+l) in one of the optical amplifiers (the first and second amplifiers) is used to emphasize gains of amplified spontaneous emission light signals of wavelengths adjacent to the specific degraded wavelength. Therefore, transmission quality is not adversely influenced by the lack of an amplified spontaneous emission light signal of the specific wavelength.

Indeed, as described on page 27, line 24 – page 28, line 24 of Applicants' specification, "Because the number of wavelengths of the multiplexed optical signal input to the optical amplifier repeater approaches the designed number of wavelengths, the same gain profile as that of the optical amplifier repeater can be maintained in the optical amplifier repeater, a gain distribution of the modulated optical signals output from the optical transmitting units 3-m to 3+m is flattened in the optical amplifier repeater, and the transmission quality of the modulated optical signals can be improved." This feature and corresponding benefit of Applicants' invention is not possible with the device of Kerfoot. Thus, for independent reasons, Applicants submit that Claims 16 and 18 patentably define over the applied references.

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[3] MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

[4] Specification, page 26, line 30 to page 27, line 23.

Accordingly, in view of the present amendment and in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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